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UNITED STATES PATENT APPLICATION

OF

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FOR

INFORMATION PROCESSING

Field of the Invention

The present invention relates to a system for information processing, a server unit which is adapted to form part of a system for information processing, a use of points on an imaginary surface for controlling the processing of information, and a user unit for recording information.

Background of the Invention

Information processing is a major problem in today's society. More and more information is produced and companies are putting in place various systems for information processing. This involves considerable costs for the companies and different interfaces for customers and employees.

Summary of the Invention

It is an object of the present invention to completely or partly obviate the problems mentioned above.

This object is achieved by means of a system for processing information according to claim 1, a server unit according to claim 17, a use according to claim 25, and a user unit according to claim 28.

More specifically, according to a first aspect of the present invention there is provided a system for information processing, which system comprises a server unit, in which is stored data about a plurality of domains, each representing an area on at least one imaginary surface, a plurality of user units, each of which is adapted to record information comprising at least two

coordinates and to transfer the information to the server unit; the server unit being adapted, in response to receiving the information from a user unit, to identify the domain to which the coordinates belong, and to determine, on the basis of the domain affiliation, how the information should be processed.

Thus, according to the invention, at least one imaginary surface is used, which is divided into domains for controlling the information processing. The information in the system is channeled by the intermediary of a server unit which identifies the domain to which the information belongs and, consequently, how it should be processed. Interested parties with different needs can have access to different domains in the system and control how their specific information should be processed by defining rules which are connected with their domain. The system is thus general while still permitting individual processing of information belonging to different interested parties.

For the user the system is uniform because the information is transferred to the same place, i.e. the server unit, and because the user is not required to define how the information should be processed. Instead, this is determined by the coordinates the user records with the user unit.

The two coordinates make it possible to determine a point on the imaginary surface and, consequently, to determine the domain affiliation. The coordinates can be

transferred to the server unit in a form that requires processing in order to determine the domain affiliation. The information which is transferred to the server unit can comprise the coordinates of more than one point. It can also comprise more than two coordinates defining a point. If there are several imaginary surfaces, a third coordinate can, for example, be used for defining which imaginary surface is involved.

The combination of the use of domains to control how the information should be processed and coordinates to define the domain affiliation is especially advantageous since many people still prefer writing short messages and the like by hand and since coordinates can also be used for defining or describing hand-written information.

It is, in fact, already known to provide a surface with a position code which enables the determination of the position of a pen (or a user unit) on the surface by reading the position code locally in the position in which the pen is located. By continuously recording the position of the pen when it used for writing text, for example, the written text can be recorded electronically in the form of coordinates for the position of the pen on the paper. Such technology is, for example, described in US 5,852,434 and in Applicant's Patent Applications SE 9901954-9 and SE 9903541-2 which were filed on 28 May 1999 and 1 October 1999 respectively and which were thus not public documents when the present application was

filed. Said Swedish patent applications are herewith incorporated by reference.

The user unit can be a digital pen which can be used for writing ordinary pigment-based information on a sheet of paper, which information is simultaneously recorded digitally in the user unit. Furthermore, the user unit can be some other handheld electronic device by means of which information can be recorded, for example a PDA with a touch screen. In this example, the information can be recorded by a user writing the information on the screen and coordinates being generated on the basis of the location on the screen where pressure is applied.

In an advantageous embodiment of the system, a domain owner is stored in the server unit for each of said domains. Different interested parties can thus rent, obtain a license for, or in some other way have exclusive right to one or several domains on the imaginary surface and in this way create an individual system for processing information within the framework of the general system and with a uniform interface to the user.

As mentioned above, for each domain, there can be rules as to how the information identified as belonging to the domain should be processed. These rules are advantageously stored in the server unit so that the server has immediate access to them when the domain affiliation of information received has been determined. The rules can be any type of rule of varying complexity.

In an advantageous embodiment the server unit is adapted to forward the information received from the user unit to a receiver. The receiver can be the domain owner or some other receiver whose address is associated with the domain. Moreover, the receiver can be a final receiver or an intermediate receiver who in turn forwards the information to the final receiver.

The receiver can also be one of said user units, for example the user unit from which the server unit received the information. If so, user-generated information can be transferred from the user unit to the server unit for processing in some desired manner controlled by the domain affiliation and then be returned to the user unit. This enables more advanced information processing than that which can be carried out in the user unit itself.

The receiver can, for example, be specified in the user-generated information or be associated with a user identity. Moreover, in an advantageous embodiment, the receiver can be defined with the aid of the domain affiliation. There can be one or several receivers for a domain. In the latter case, each receiver can be connected with a subset of a domain.

The information can be passed on in various forms, electronic or physical for example, and by different means. This can also be controlled by the domain affiliation.

In one embodiment, the server unit can be adapted to attach a data structure to the information sent to the

receiver, for example a document file or a program file, which is defined by the domain affiliation. This situation may arise if a domain owner uses the information processing system for disseminating information about its products to its customers. In that case, the owner marks his products with coordinates associated with the domain. A user records the coordinates by means of a user unit which transfers them to the server unit. As a result of the identification of the domain, the server unit sends a file containing information about the product to the user.

In a further embodiment, the server unit can be adapted to store the information received from the user unit in a location indicated by the domain affiliation. One example of an application is that a user writes notes which are to be stored in the server unit, or in some other location in the network of which the server unit forms part, in such a way that they are accessible to others. In this case, information concerning a storage location is associated with the domain defined by the coordinates in the information.

The server unit can be adapted to process the information received from the user unit, for example before transferring it to the receiver, in a way defined by the domain affiliation. The processing can, for example, consist of refining the information and/or supplementing the information and/or verifying the information. Supplement-

ing can, for example, consist of said attachment of a document file.

An interested party can thus define the processing which is to be carried out with respect to information associated with his domain. This processing is implemented in the server unit and need not be implemented in the interested party's own system. If several interested parties wish to have similar functions, synergies may arise.

As mentioned above, with the aid of the user unit, a user can write characters which are recorded with the aid of the user unit in the form of coordinates for the positions of the user unit on the sheet of paper. In that case, the information transferred to the server unit will contain a much larger number of coordinates than the two required for determining the domain affiliation. The server unit is advantageously adapted to transform the received coordinates into at least one character in character-coded format.

If the interpretation of the information generated by means of the user unit is carried out in the server unit instead of in the user unit, a much more powerful character interpreter (e.g. ICR software) can be used than is economically justified for each single user unit. In addition, it is easier to upgrade the character interpreters in the server unit than in each user unit.

Manual character interpretation can be carried out as an alternative to automatic character interpretation.

Advantageously, each user unit has a pen point. When the user writes something by means of the user unit he will then obtain a paper copy as well as an electronic description of what he has written. However, the user unit can be used exclusively for electronic recording of coordinates.

The above operations carried out by the server unit are preferably performed with the aid of suitable software in the server unit.

Suitably, the user unit has a unique user identity, the user unit being adapted to include the user identity in the information to the server unit. The unique identity can, for example, be a production number or some form of code that has been stored in the user unit specifically for this purpose. The user unit can be used by the server unit or by a domain owner to identify the sender of the information, for example when a reply is to be sent to the sender.

As is evident from the above, the system advantageously comprises a plurality of products from which said coordinates are recorded. The products can be any product which can be provided with coordinates that can be recorded by means of a user unit. Products which are particularly suited to being provided with coordinates are all types of products with a writing surface, such as a sheet of paper.

In an advantageous embodiment, a subset of a position-coding pattern, which codes a large number of

points on said imaginary surface, is reproduced on each of said products, the coordinates recorded by the user unit being coordinates for points on the imaginary surface and being recorded with the aid of the subset of the position-coding pattern on the product. The subset is preferably located within a domain. Figuratively speaking, it can be viewed as cutting out a subset or a partial area of the position-coding pattern and placing it on the product. This partial area codes at least one point on the imaginary surface. By reading the position-coding pattern in the partial area, it is possible to determine the coordinates of one or several points in the partial area and, with the aid of these coordinates, it is thus possible to determine the domain affiliation and, consequently, how the information transferred to the server unit should be processed. The partial area preferably codes several points on the imaginary surface so that characters can be written on the partial area and be recorded digitally.

Advantageously, the position-coding pattern can be made up of symbols and each point on said imaginary surface can be coded by a predetermined number of symbols. In that case, each user unit is adapted, when it is moved across said partial area for generating the information, to continuously record the symbols, locally within its field of view, in order to provide a description of the movement in coordinate form.

In each position, the user unit must thus be capable of recording the number of symbols required for identifying a point in the form of its coordinates. When the user unit is moved across the surface it will identify a sequence of points which together describe how the user unit has been moved and thus the information generated by the user unit in connection with the movement.

The user unit can transfer the recorded symbols directly to the server unit. In that case, the coordinates are thus received in coded format. As a preferred alternative, the user unit can determine the coordinates to which the symbols correspond before the information is transferred to the server unit. Preferably, the user unit also compresses the description of the movement of the user unit, for example by only including some of the coordinates in the information to the server unit.

According to a second aspect of the invention it relates to a server unit, which is adapted to form part of a system for information processing, the server unit having a memory in which is stored data about a plurality of domains, each corresponding to an area on at least one imaginary surface, and the server unit being adapted, in response to receiving the information which contains at least two coordinates, to identify the domain to which the coordinates belong and, on the basis of the domain affiliation, determine how the information should be processed.

According to a third aspect of the invention it relates to the use of points on at least one imaginary surface for controlling the processing of the information, which surface is divided into domains, rules concerning how the information containing the coordinates for at least one point within this domain should be processed being connected with each domain.

The advantages of the server unit and the use are evident from the discussion concerning the system.

According to a fourth aspect of the invention it relates to a user unit for recording information, which user unit is adapted to record at least two coordinates, to determine whether the coordinates represent a point in a first or a second area on an imaginary surface, and to send a message comprising said at least two coordinates to a predetermined external unit if the point belongs to the first area.

This user unit utilizes the same principle as the one described above; i.e. the information processing is controlled with the aid of partial areas on an imaginary surface. In a user unit this can, for example, be used for ensuring that a certain type of information is automatically forwarded to a server unit, while other types of information are processed locally in the user unit.

Brief Description of the Drawings

The present invention will now be described in more detail by way of exemplifying embodiments with reference to the accompanying drawings, in which

Fig. 1 schematically shows a system according to an embodiment of the present invention;

Fig. 2 schematically shows an example of a user unit; and

Fig. 3 schematically shows an example of a storage structure for domain-based rules for information processing.

Description of Preferred Embodiments

Fig. 1 shows an example of how a system according to the invention can be structured. The system generally comprises a plurality of products, a plurality of user units, a plurality of network connection units, and a server unit. However, for the sake of clarity, only one product 1, one user unit 2, one network connection unit 3, and one server unit 4 are shown in Fig. 1.

The Product

The product 1 can be any type of product which can be provided with coordinates such that they can be read by the user unit. The coordinates can be stated either explicitly or in coded form. Preferably, the product has a writing surface upon which the coordinates are arranged.

In this example, the product 1 consists of a sheet of paper which is provided with a position-coding pattern 5 across its entire surface, which position-coding pattern is shown very schematically and enlarged as a number of dots on the sheet of paper. The position-coding pat-

tern on the product constitutes a subset of a larger position-coding pattern.

The Position-coding Pattern

The position-coding pattern 5 has the characteristic that if an arbitrary part of the pattern of a certain smallest size is recorded, the position of this part in the position-coding pattern and thus on the sheet of paper can be unambiguously determined.

The position-coding pattern 5 can be of the type shown in the above-mentioned US 5,852,434, where each position is coded by a specific symbol.

However, the position-coding pattern is advantageously of the type shown in Applicant's above-mentioned Applications SE 9901954-9 and SE 9903541-2, where each position is coded with a plurality of symbols and each symbol contributes to the coding of several positions.

The position-coding pattern is made up of a small number of symbol types. One example is shown in SE 9901954-9, where a larger dot represents a "one" and a smaller dot represents a "zero". Another example is shown in SE 9901954-9, where four different displacements of a dot in relation to a raster point code four different values.

The User Unit

Fig. 2 shows an example of a user unit, which in this case consists of a digital pen. The pen comprises a casing 11 having approximately the same shape as a conventional pen. In one short side of the casing there is

an opening 12. The short side is intended to abut against or be placed a short distance from the surface on which the position determination is to be carried out.

The casing 1 essentially contains an optics part, an electronic circuitry part, and a power supply.

The optics part comprises at least one light-emitting diode 13 for illuminating the surface which is to be imaged and a light-sensitive area sensor 14, such as a CCD or CMOS sensor, for recording a two-dimensional image. The user unit may also comprise a lens system.

The power supply to the control device is obtained from a battery 15, which is mounted in a separate compartment in the casing.

The electronic circuitry part contains a processor 16 which is programmed to read an image from the sensor 14, to identify symbols in the image, to determine which two coordinates are coded by the symbols, and to store these coordinates in its memory. Furthermore, the processor 16 is programmed to analyze stored coordinate pairs and to transform them into a train of polygons which constitutes a description of the movement of the user unit across a surface provided with the position-coding pattern. Finally, the processor is programmed to generate a message containing the train of polygons and a unique user identity which is stored in the user unit and to transfer this information to the server unit 4 by the intermediary of the transceiver 19 and the network connection unit 3.

The processor 16 need not forward all the information to the server unit 4. The processor 16 can be programmed to analyze the recorded coordinates and only forward information represented by coordinates within a certain coordinate area.

The user unit also comprises a pen point 17, with the aid of which the user can write ordinary pigment-based writing which is simultaneously recorded by the user unit with the aid of the position-coding pattern. The pen point 17 is extendable and retractable so that the user can control whether or not it is to be used.

Moreover, the user unit comprises buttons 18 by means of which the user activates and controls the unit. It also comprises a transceiver 19 for wireless communication, for example by means of IR light or radio waves, with external units.

Communication with the Server Unit

The user unit is adapted to transfer information generated by the user to the server unit 4. In this example, the information is transferred by wireless means to the network connection unit 3, which in turn transfers the information to the server unit 4.

In this example, the network connection unit is a mobile telephone 3. Alternatively, it can be a computer or some other suitable unit having an interface to a network, for example the Internet or a local company network.

Alternatively, the network connection unit 3 can be integral with the user unit 2.

The communication between the user unit and the network connection unit, which are normally located fairly close to each other, can take place via IR or radio waves, for example according to the Bluetooth standard, or some other standard for information transfer over short distances. The transfer need not be wireless; rather, it can also be carried out by wire.

The Server Unit

The server unit is a computer in a computer network. It has the same structure as a conventional server unit with one or more processors, various kinds of memories, peripherals, and connections to other computers in the network, but it has new software for carrying out the operations described herein. It also has information stored in its memory to enable it to manage these operations.

All the user units are adapted to transfer their information to the server unit, which is thus a central unit in the system. However, several such systems put together can form an even larger system.

The server unit need not be part of a wide area network; rather, it can be part of a local area network and be used for processing information, for example, within a company.

The Imaginary Surface

In the memory of the server unit is stored information about domains on at least one imaginary surface. The imaginary surface can be described as a surface in a coordinate system, which surface thus contains a large number of points which are systematically arranged in two dimensions with a certain given resolution. Each point can be defined by two coordinates. If there is more than one imaginary surface, more than two coordinates may be required to define a point.

On the imaginary surface there are a number of areas which can thus be described as domains. The domains can be of different sizes and shapes. The smallest domain comprises a single point on the surface. The whole surface need not be covered with domains. Information about the different domains is stored in the server unit. A rectangular domain can, for example, be described with the aid of pairs of coordinates representing the points in the corners of the domain.

Rules

In a data structure in the memory of the server unit there is data or rules for each domain defining how the information associated with the domain should be processed.

Fig. 3 shows an example of such a structure, which in this case is a table. In a first column 30 in the table the domains on the imaginary surface are defined with the aid of the coordinates (x1,y1; x2,y2; x3,y3;

x4,y4) for the corners of the domains which in this case are assumed to be rectangular. A second column 32 defines a user of the domain, in this case company A. A third column 32 defines a receiver of the information determined to be associated with the domain. In this case, the receiver is identical with the owner and is indicated by means of an e-mail address to which the information is to be sent. A fourth column 33 indicates whether or not the information should be interpreted. In this case, an interpretation shall take place since a "one" is written in the column. A fifth and final column defines whether or not the information should be sent in encrypted format. In this case, the "zero" in the column indicates that it should not.

This is, of course, a very simplified structure which is only used to illustrate the principles. Much more complex structures and rules for the information processing may be used.

Operation of the System

The operation of the system is as follows in this embodiment: A user writes information on the sheet of paper 1 using the user unit 2. The information is recorded electronically while it is being written by the user unit continuously recording the part of the position-coding pattern which is located within the field of view of the area sensor while the user is writing. The processor 16 transforms the position-coding pattern into coordinates. The processor thus generates a sequence of

coordinates describing how the user has moved the user unit across the sheet while writing. The processor compresses this information by transforming it into a train of polygons. Subsequently, the processor generates a message containing the train of polygons. The message is transferred to the network connection unit 3 which in turn transfers the message to the server unit 4.

When the server unit 4 receives the message it determines the domain to which one or several of the points in the train of polygons belong. Subsequently, it uses the rules associated with the domain for determining how the message should be processed.

Application Example 1

Suppose that a transport company wishes to use the system for gathering information in connection with deliveries. In that case, the transport company will rent a domain on the imaginary surface. The transport company is stored as the owner of this domain in the server unit. Furthermore, the transport company defines rules for how the information identified as belonging to this domain should be processed.

In this example, the transport company wants the server unit to interpret the information it receives and forward it in character-coded format to the transport company's server together with the user identities of the user units. The transport company provides its drivers with user units and forms provided with position-coding patterns. When a driver delivers a package, he fills out

a form with the aid of the pen point on the user unit which continuously records the position-coding pattern on the form as the user writes text and ticks off boxes on the form. The user unit decodes the position-coding pattern, generates a sequence of coordinates describing the movement of the user unit across the form and transfers this coordinate sequence and the identity of the user unit in a message to the driver's mobile telephone, which forwards the message to the server unit in the system. The server unit uses two or more coordinates in the message to determine the domain to which the message belongs. The domain affiliation determines that the coordinate sequence in the message should be interpreted and forwarded in character-coded format to the transport company's server and these operations are subsequently carried out. Thus, the transport company automatically receives a message to its server mirroring the information on the form.

Application Example 2

Another application example is a company that sells postcards. This company obtains access to a domain in the system. The company sells postcards that look like ordinary postcards with an image on the front and an address field on the back. The postcard can be used as an ordinary postcard, but it is also provided with a position-coding pattern covering its whole reverse side. This means that, with the aid of a user unit, a user can write a message in the message field and an e-mail address or

the like in the address field on the reverse side of the postcard. The user unit records the position-coding pattern while being moving across the reverse side of the postcard and generates a coordinate sequence representing the text being written. The coordinate sequence is transferred to the server unit, which determines the domain affiliation. In this case, the domain rules state that the information should be character-coded and transferred to the postcard company together with data indicating the partial area of the domain in which the information is written. Subsequently, the postcard company can match the image associated with the partial area in question with the information and send all of it as an e-mail message to the addressee indicated in the message. Alternatively, this can be carried out directly by the server unit in the information processing system.

Application Example 3

A further example of an application is that a company which sells a product A can use the information system for distributing information to interested buyers of the product A. In this case, the company rents a domain which can be relatively small, in the extreme case only one point on the imaginary surface. The company marks its products with the position-coding pattern which codes the domain. A user who is interested in receiving more information about the product records the whole position-coding pattern (in this case representing several points) or a part thereof with the aid of a user unit which

transfers the point or points to the server unit together with the user identity of the user unit. In this case, a rule may be connected with the domain which says that information which is associated with the domain should only be forwarded to a computer belonging to the domain owner. In response to receiving the information, the owner's computer sends product information to the user. The information can be sent in the form of a file which opens the owner's Internet homepage on the user's mobile telephone or computer or as an e-mail message. In both cases, the user's address for information reception must either be included in the information from the user or be recorded somewhere so that it can be retrieved with the aid of the user identity.

What I claim and desire to secure by Letters Patent is:

1. A system for information processing, which system comprises

a server unit (4), in which is stored data about a plurality of domains, each representing an area on at least one imaginary surface,

a plurality of user units (2), each of which is adapted to record information comprising at least two coordinates and to transfer the information to the server unit;

the server unit (4) being adapted, in response to receiving the information from a user unit (2), to identify the domain to which the coordinates belong, and, on the basis of the domain affiliation, determine how the information should be processed.

2. A system according to claim 1, wherein a domain owner for each of said domains is stored in the server unit (4).

3. A system according to claim 1 or 2, wherein, for each of said domains, rules indicating how the information identified as belonging to the domain should be processed are stored in the server unit.

4. A system according to claim 1, 2 or 3, wherein the server unit (4) is adapted to forward the information received from the user unit to a receiver.

5. A system according to claim 4, wherein the receiver is defined by the domain affiliation.

6. A system according to claim 4 or 5, wherein the receiver is one of said user units (2).

7. A system according to claim 4, 5 or 6, wherein the server unit (4) is adapted to attach a predetermined data structure to the receiver, which data structure is determined by the domain affiliation.

8. A system according to claim 1, 2 or 3, wherein the server unit (4) is adapted to store the information received from the user unit (2) in a location indicated by the domain affiliation.

9. A system according to any one of the preceding claims, wherein the server unit (4) is adapted to process the information received from the user unit (2) in a manner defined by the domain affiliation.

10. A system according to any one of the preceding claims, wherein said at least two coordinates are a plurality of coordinates defining characters and wherein the server unit (4) is adapted to transform the received coordinates into at least one character.

11. A system according to any one of the preceding claims, wherein each of the user units has a pen point (17).

12. A system according to any one of the preceding claims, wherein each of the user units (2) has a unique user identity and is adapted to include the user identity in the information transferred to the server unit.

13. A system according to any one of the preceding claims, further comprising a plurality of products (1) from which said at least two coordinates are recorded.

14. A system according claim 13, wherein a subset (5) of a position-coding pattern, which codes a large number of points on said imaginary surface, is reproduced on each of said products, the coordinates recorded by the user units being coordinates for points on the imaginary surface and being recorded with the aid of the subset of the position-coding pattern on the product.

15. A system according to claim 14, wherein the position-coding pattern is made up of symbols and each point on said imaginary surface is coded by a predetermined number of symbols, and wherein each user unit, when it is moved across said subset for generating the information, is adapted to continuously record the symbols for providing a description of the movement in coordinate form.

16. A system according to any one of the preceding claims, wherein each user unit is adapted to record said information by recording the coordinates in coded form, to decode the coded coordinates, and to include at least some of the coordinates in the information transferred to the server unit.

17. A server unit, which is adapted to form part of a system for information processing,

(continued)

(continued claim 17)

the server unit having a memory in which is stored data about a plurality of domains, each corresponding to an area on an imaginary surface,

the server unit being adapted, in response to receiving the information which contains at least two coordinates, to identify the domain to which the coordinates belong, and, on the basis of the domain affiliation, to determine how the information in the message should be processed.

18. A server unit according to claim 17, wherein a domain owner for each of said domains is stored in the server unit (4).

19. A server unit according to claim 17 or 18, wherein, for each of said domains, rules indicating how the information identified as belonging to the domain should be processed are stored in the server unit (4).

20. A server unit according to claim 17, 18 or 19, wherein the server unit (4) is adapted to forward the information to a receiver.

21. A server unit according to any one of claims 17-20, wherein the server unit (4) is adapted to attach a predetermined file to the information sent to the receiver, which file is determined by the domain affiliation.

22. A server unit according to any one of claims 17-21, wherein the server unit (4) is adapted to store

(continued)

(continued claim 22)

the information in a location indicated by the domain affiliation.

23. A server unit according to any one of claims 17-22, wherein the server unit (4) is adapted to process the information in a manner defined by the domain affiliation.

24. A server unit according to claim 23, wherein the server unit (4) is adapted to transform the received coordinates into a at least one character.

25. Use of points on an imaginary surface for controlling the processing of information, which surface is divided into domains, wherein rules are connected with each of said domains indicating how the information containing the coordinates for at least one point within the domain should be processed.

26. Use according to claim 25, which use comprises providing a product (1) with a part of a position-coding pattern which codes a large number of points on the imaginary surface, which part is located within a domain.

27. A user unit for recording information, which user unit is adapted to record at least two coordinates, c h a r a c t e r i z e d in that the user unit is adapted to determine whether the coordinates represent a point in a first or a second area on an imaginary surface and to send a message comprising said at least two coordinates to a predetermined external unit if the point belongs to the first area.

28. A user unit according to claim 17, which consists of a digital pen.

Fig. 3

30 Domain	31 Owner	32 Receiver	33 Interpretation	34 Encryption
$(x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4)$	Company A	A @ hem.com	1	0